

## § 178.965

vary by up to  $\pm 5$  percent relative humidity without significant impairment of test reproducibility; or

(3) For testing at periodic intervals only (*i.e.*, other than initial design qualification testing), at ambient conditions.

### § 178.965 Drop test.

(a) *General.* The drop test must be conducted for the qualification of all Large Packaging design types and performed periodically as specified in § 178.955(e) of this subpart.

(b) *Special preparation for the drop test.* Large Packagings must be filled in accordance with § 178.960.

(c) *Conditioning.* Rigid plastic Large Packagings and Large Packagings with plastic inner receptacles must be conditioned for testing by reducing the temperature of the packaging and its contents to  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) or lower. Test liquids must be kept in the liquid state, if necessary, by the addition of anti-freeze. Water/anti-freeze solutions with a minimum specific gravity of 0.95 for testing at  $-18^{\circ}\text{C}$  ( $0^{\circ}\text{F}$ ) or lower are considered acceptable test liquids, and may be considered equivalent to water for test purposes. Large Packagings conditioned in this way are not required to be conditioned in accordance with § 178.960(d).

(d) *Test method.* (1) Samples of all Large Packaging design types must be dropped onto a rigid, non-resilient, smooth, flat and horizontal surface. The point of impact must be the most vulnerable part of the base of the Large Packaging being tested. Following the drop, the Large Packaging must be restored to the upright position for observation.

(2) Large Packaging design types with a capacity of 0.45 cubic meters (15.9 cubic feet) or less must be subject to an additional drop test.

(e) *Drop height.* (1) For all Large Packagings, drop heights are specified as follows:

- (i) Packing group I: 1.8 m (5.9 feet)
- (ii) Packing group II: 1.2 m (3.9 feet)
- (iii) Packing group III: 0.8 m (2.6 feet)

(2) Drop tests are to be performed with the solid or liquid to be transported or with a non-hazardous material having essentially the same physical characteristics.

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(3) The specific gravity and viscosity of a substituted non-hazardous material used in the drop test for liquids must be similar to the hazardous material intended for transportation. Water also may be used for the liquid drop test under the following conditions:

(i) Where the substances to be carried have a specific gravity not exceeding 1.2, the drop heights must be those specified in paragraph (e)(1) of this section for each Large Packaging design type; and

(ii) Where the substances to be carried have a specific gravity exceeding 1.2, the drop heights must be as follows:

(A) Packing Group I:  $\text{SG} \times 1.5$  m (4.9 feet).

(B) Packing Group II:  $\text{SG} \times 1.0$  m (3.3 feet).

(C) Packing Group III:  $\text{SG} \times 0.67$  m (2.2 feet).

(f) *Criteria for passing the test.* For all Large Packaging design types there may be no loss of the filling substance from inner packaging(s) or article(s). Ruptures are not permitted in Large Packaging for articles of Class 1 which permit the spillage of loose explosive substances or articles from the Large Packaging. Where a Large Packaging undergoes a drop test, the sample passes the test if the entire contents are retained even if the closure is no longer sift-proof.

[75 FR 5400, Feb. 2, 2010, as amended at 75 FR 60339, Sept. 30, 2010]

### § 178.970 Bottom lift test.

(a) *General.* The bottom lift test must be conducted for the qualification of all Large Packagings design types designed to be lifted from the base.

(b) *Special preparation for the bottom lift test.* The Large Packaging must be loaded to 1.25 times its maximum permissible gross mass, the load being evenly distributed.

(c) *Test method.* All Large Packaging design types must be raised and lowered twice by a lift truck with the forks centrally positioned and spaced at three quarters of the dimension of the side of entry (unless the points of entry are fixed). The forks must penetrate to three quarters of the direction of entry.

(d) *Criteria for passing the test.* For all Large Packagings design types designed to be lifted from the base, there may be no permanent deformation which renders the Large Packaging unsafe for transport and there must be no loss of contents.

**§ 178.975 Top lift test.**

(a) *General.* The top lift test must be conducted for the qualification of all of Large Packagings design types to be lifted from the top or, for flexible Large Packagings, from the side.

(b) *Special preparation for the top lift test.* (1) Metal and rigid plastic Large Packagings design types must be loaded to twice its maximum permissible gross mass.

(2) Flexible Large Packaging design types must be filled to six times the maximum permissible gross mass, the load being evenly distributed.

(c) *Test method.* (1) A Large Packaging must be lifted in the manner for which it is designed until clear of the floor and maintained in that position for a period of five minutes.

(2) Rigid plastic Large Packaging design types must be:

(i) Lifted by each pair of diagonally opposite lifting devices, so that the hoisting forces are applied vertically for a period of five minutes; and

(ii) Lifted by each pair of diagonally opposite lifting devices so that the hoisting forces are applied towards the center at 45° to the vertical, for a period of five minutes.

(3) If not tested as indicated in paragraph (c)(1) of this section, a flexible Large Packaging design type must be tested as follows:

(i) Fill the flexible Large Packaging to 95% full with a material representative of the product to be shipped.

(ii) Suspend the flexible Large Packaging by its lifting devices.

(iii) Apply a constant downward force through a specially designed platen. The platen will be a minimum of 60 percent and a maximum of 80 percent of the cross sectional surface area of the flexible Large Packaging.

(iv) The combination of the mass of the filled flexible Large Packaging and the force applied through the platen must be a minimum of six times the maximum net mass of the flexible

Large Packaging. The test must be conducted for a period of five minutes.

(v) Other equally effective methods of top lift testing and preparation may be used with approval of the Associate Administrator.

(d) *Criterion for passing the test.* For all Large Packagings design types designed to be lifted from the top, there may be no permanent deformation which renders the Large Packagings unsafe for transport and no loss of contents.

**§ 178.980 Stacking test.**

(a) *General.* The stacking test must be conducted for the qualification of all Large Packagings design types intended to be stacked.

(b) *Special preparation for the stacking test.* (1) All Large Packagings except flexible Large Packaging design types must be loaded to their maximum permissible gross mass.

(2) Flexible Large Packagings must be filled to not less than 95 percent of their capacity and to their maximum net mass, with the load being evenly distributed.

(c) *Test method.* (1) All Large Packagings must be placed on their base on level, hard ground and subjected to a uniformly distributed superimposed test load for a period of at least five minutes (see paragraph (c)(5) of this section).

(2) Fiberboard and wooden Large Packagings must be subjected to the test for 24 hours.

(3) Rigid plastic Large Packagings which bear the stacking load must be subjected to the test for 28 days at 40 °C (104 °F).

(4) For all Large Packagings, the load must be applied by one of the following methods:

(i) One or more Large Packagings of the same type loaded to their maximum permissible gross mass and stacked on the test Large Packaging;

(ii) The calculated superimposed test load weight loaded on either a flat plate or a reproduction of the base of the Large Packaging, which is stacked on the test Large Packaging; or

(5) *Calculation of superimposed test load.* For all Large Packagings, the load to be placed on the Large Packaging must be 1.8 times the combined